EMBRY-RIDDLE URI UNDERGRADUATE RESEARCH INSTITUTE

UNDERGRADUATE RESEARCH ABSTRACTS

EMBRY-RIDDLE DISCOVERY DAY 2015

Prescott, Arizona

Discovery Day Schedule of Events

Poster Display
AC1-Atrium | 10:00 AM-3:30 PM

Oral Presentations
AC1-114 and 118 | 11:45 AM-1:00 PM

Poster Presentations & Demonstrations
AC1-Atrium | 1:00-3:30 PM

Exemplary Research Presentations & Annual Research Awards
Davis Leaning Center | 4:00-5:00 PM

Chancellor's Reception
Hangar | 6:00-9:00 PM

DR. FRANK AYERS
Chancellor, Embry-Riddle Aeronautical University – Prescott

Welcome to Discovery Day 2015

Thanks to all of you who are making this, our third annual Discovery Day, a great success. It is our privilege to support the efforts of our students through our Ignite and Eagle Prize initiatives, as well as through their classwork and special projects. We take time to celebrate their work every spring during Discovery Day. Today you will see the best work of our students, faculty, and staff on display and will have an insight into what makes them such a special group. Take the time to ask each of our project teams to explain the what, why, and how of their projects and be prepared to understand how the leaders of tomorrow are preparing today. To our students, we realize that these projects are how you express yourselves through imagination and creativity. To our faculty and staff, thanks for taking the time to work together with these amazing young scholars. Finally, to our parents, thanks for entrusting these great young people to our care. My wife Debbie and I look forward to wandering around all day and hope to see you at each of the Discovery Day venues.

Warm Regards,

Dr. Frank Ayers
Chancellor, Embry-Riddle
Aeronautical University – Prescott, Arizona

ANNE BOETTCHER
Director, Undergraduate Research Institute and Honors Program

It has been an exciting year for our undergraduates, as is reflected in the breadth and depth of the presentations and demonstrations included in our third annual discovery Day. During the 2014-2015 Academic Year, the Undergraduate Research Institute was able to award a total of 20 Ignite research/scholarship grants and seven Eagle Prize competition grants. For Ignite, projects ranged from focusing on the oral history of veterans to the first student team to fly a rocket to space. Eagle Prize teams will compete in regional and national competitions including the Arizona VEX U Tournament, Association for Unmanned Vehicle Systems International Student Competition, and NASA Human Exploration Rover Challenge.

In addition, our students have been conducting independent and team research projects through course-based and student organization opportunities. Linked to their research and scholarship, these students have been active in numerous outreach efforts with regional middle and high schools.

In my short time at the Prescott Campus, I have repeatedly been impressed with the insight, dedication, and determination of our students, faculty and staff. Through their combined efforts, our students are gaining the skills needed to be successful in their chosen career paths.

Thank you for helping us celebrate the accomplishments of our students.

Anne Boettcher
Director, Undergraduate Research Institute and Honors Program
Embry-Riddle Aeronautical University – Prescott, Arizona

Undergraduate Research Institute Advisory Board

Elizabeth Davis, Humanities and Communication; Erica Diels, Aeronautical Sciences; Iacopo Gentilini, Aerospace and Mechanical Engineering; Brennan Hughey, Physics; Karen Meunier, Intelligence Studies and Global Affairs; Melanie Wetzel, Meteorology; Patricia Watkins, Hazy Library and Learning Center; and Gary Yale, Aerospace and Mechanical Engineering

Undergraduate Research Institute

Anne Boettcher, Director; Ginger MacGowan, Administrative Assistant; and Melanie Wetzel, Program Manager

A special note of thanks to all of our mentors!

Oral Presentation Schedule

LOCATION: AC1-114

11:45 AM-12:00 PM
Measurement of Lifetime of Cosmic Ray Muons
Ian Brubaker, John Dallyn, Jasmine Gill
Mentor: Darrel Smith

12:00-12:15 PM
LIGO-Virgo-SWIFT Collaboration on the Emission of Gravitational Waves from Supernovas
Kiranjyot Gill
Mentor: Michele Zanolin

12:15-12:30 PM
The Construction and Application of Radio Astronomy Equipment at the Embry-Riddle Radio Observatory (ERRO)
Matthew Wittal
Mentor: Andri Gretarsson

12:30-12:45 PM
Would Training for Emergency Room Doctors and Nurses Decrease Human Trafficking Rates?
Kelly Feng
Mentor: Karen Meunier

12:45-1:00 PM
Is White-Collar Crime A Serious Threat and Does Public Perception Affect Penalization?
Tyson Williams
Mentors: Thomas Foley, Karen Meunier, and Geoffrey Jensen

LOCATION: AC1-118

11:45 AM-12:00 PM
The Effects of Finite Difference Schemes on the Accuracy and Stability of CFD Models
Brian Cowley
Mentor: Wally Morris II

12:00-12:15 PM
The Effects of Upper Surface Modifications on Low Reynolds's Flight
John Marbut
Mentor: Lance Traub

12:15-12:30 PM
Analysis of Winglets for Low Reynolds UAV Flight Regimes
Aaron Pigott
Mentor: Shigeo Hayashibara

12:45-1:00 PM
Modeling, Validation, and Energy-Efficient Control of Six-Rotor Aircraft for Multi-Goal Inspection Missions
Kevin Vicencio
Mentors: Iacopo Gentillini and Ken Bordignon

Posters and Demonstrations Presentations

(Number Corresponds to Poster/ Demonstration Number)

LOCATION: AC1-ATRIUM

1. **NASA Human Exploration Rover Challenge (Poster & Demonstration)**
   Estelle Fortes, Johnnie Perry, Jessica Turcios, and Jessica Chow
   Mentor: Brenda Haven

2. **Supersonic High Atmospheric Remotely Piloted Unmanned Aircraft System (SHARP UAS) (Poster & Model)**
   Paul Adelgren, Ryan Ashey, and John Lewandowski
   Mentor: Michael Fabian

3. **Unmanned Aerial Vehicle (UAV) Propulsion Research: Conceptual studies of Ultra-Compact Shaft-less Jet Engines for Next Generation UAVs**
   Tyler Eiguren, Trever Douglas, and Tre Buchanan
   Mentors: Michael Fabian and Shigeo Hayashibara

4. **Small Unmanned Aerial System for Aerial Mapping and Infrared Detection**
   Nick Harris, James McClure, Daniel Shreiar, Jason Lathbury, Jesse Ives, Kevin Prasad, Michael Trovato, Andrew Grant, Lorenzo Coykendall, Flaviu Ciobanu, Russell Meehan, and Michael Roznick
   Mentor: Sean Jeralds

5. **Networking of Autonomous Small Unmanned Aerial Systems (SUAS)**
   Jacob Heilmann, Kevin Cloonan, Nicholas Arnold, and Brenda Moerchen
   Mentor: Jeffrey Ashworth

6. **ERAU AIAA Design-Build-Fly**
   Bryce Milnes and Chris Crawford
   Mentors: David B. Lanning, Jr. and Jacob W. Zwick

7. **SAE Eagle Aero: Design Build Fly Competition**
   Sho Okayama, Balmis Lopez, Blaise Golden, TJ Lilyeblade, and Tim Carver
   Mentor: Shigeo Hayashibara

8. **Human Powered Aircraft Project: Propulsion**
   Mark Van Bergen, Kevin Horn, Michael Chastain, Ryan Burns, and Chris Jacobs
   Mentor: Gary Yale

9. **Effect of Gurney Flaps on Aft Swept Wings**
   Michelle Clifford and Samarth Marudheri
   Mentor: Lance Traub

10. **Blended Wing Aerodynamic Research**
    Michelle Clifford, Tatiana Torriani, Seerat Sangha, Morgan Conklin, Hannah Morris, and Noor Rashid
    Society of Women Engineers Research Committee

11. **The Level of Supervision Over Individuals on Probation Affects the Rate of Recidivism**
    Isaac Anderson, Peter Bailey, Melissa Berg, Julamon Boonprohm, Sophia Bull, Jessica Embrey, Ryan Ferguson, Cameron McCauley, Chelsey Mendenhall, Austin Mosgrove, Rachel Parrent, Mary Ripps, Ashley Ruzicki, and Rikki Stutsman
    Mentor: Karen Meunier

12. **The Chronicles: A Living History Project**
    Karina Munoz, Dakota Burklund, Aspen Weichberger, Glenn Borland, Bethany Hawkins, Darvyn Robinson, and Nathaniel Howard
    Mentor: Geoffrey Jensen

13. **Is White-Collar Crime A Serious Threat and Does Public Perception Affect Penalization?**
    Tyson Williams
    Mentors: Thomas Foley, Karen Meunier, and Geoffrey Jensen

14. **A Concept Model for Comparative Analysis Applied to the U.S. Airline Industry**
    Michelle Bennett
    Mentors: Jacqueline Luedtke and Brent Bowen

15. **A Comeback for the Combi Carrier**
Lucas Mackey
Mentor: Cindy Greenman

16. **LIGO-Virgo-SWIFT Collaboration on the Emission of Gravitational Waves from Supernovas**
Kiranjyot Gill
Mentor: Michele Zanolin

17. **Mesoscale Simulation of a Convective Frontal Passage**
Travis Swaggerty
Mentors: Melanie Wetzel and Dorothea Ivanova

18. **Eagle Aerospace IREC Team**
William Carpenter, Jayneth Bangalore, Aaron Butler, Bryce Chanes, Curt Chen, Daniel Griffith, and Katherine Higgins
Mentor: Michael Fabian

19. **Eagle Space Flight Team**
Bryce Chanes
Mentors: Julio Benavides and *Matthew Haslam*

20. **Eagle Space Flight Team Propulsion Group**
William Carpenter, Aaron Butler, Julia Levitt, Laura Pelletier, Richard Reksoatmodjo, Raeann VanSickle, and Ben Wilson
Mentor: Brenda Haven

21. **Eagle Space Flight Team Electronics Group**
Thomas Fifer, Alaysia Marshall, Garrison Bybee, Branden Olson, Brandon Klefman, Shawn Thompson, Ryan Claus, and Tyler Graveline
Mentors: Dennis Kodimer and Matthew Jaffe

22. **Eagle Space Flight Team Aerodynamics Group**
Neil Nunan, Alexander Lubiarz, Carl Leake, Catherine Ayotte, Donald Crowder, Jesse Ives, Jonathan Kozich, and Nicholas Liapis
Mentors: Julio Benavides and William Crisler

23. **Eagle Space Flight Team Structures Group**
Chad Reinart, Alexander Collins, Brandon Parrish, Claire Schindler, Loren Bahr, Nicole Shriver, Nina Rogerson, and Veronica McGowan
Mentors: Julio Benavides and Mark Sensmeier

24. **Precision Automated Lander (PAUL) (Poster & Demonstration)**
Christina Halverson, Benjamin Anderson, Aaron Taylor, Kyle Solloway, Meghan Callaway, Kevin Vicencio, Jennifer Transue, Mo Sabliny, Adrienne Rector, Zachary Henney, Matthew Brown, Alexander Noyes, and Stephen Hahn
Mentors: Julio Benavides and M. Angela Beck

25. **Team Eagle Wingsuit: Improving Wingsuit Performance and Design**
Caity L. Mello, Jason Lathbury, Matthew Vis, Glenn H. Borland, Brian Cowley, Joshua W. Warren, Christopher R. Reed, Ben Salisbury, Joseph John Gomez, and Emily K. Gray
Mentor: Timothy Sestak

27. **Eagle Robotics Firefighting Robot (Poster & Demonstration)**
Ricardo Fernandez Garcia, David Gómez Herrera, Narendran Muraleendharan, Geoffrey Winship, Daniel Cohen, Lashin Akimkulov, John S. Cybulski Jr. , Thomas Fifer, Gavin Hofer, and Kevin Horn
Mentors: Douglas R. Isenberg and Stephen Bruder

28. **2014-2015 Vex Robotics Team**
Geoffrey Winship, Soe Abitia, Magnus Bergman, Kristin Sanddager, Josh Warren, Bryce Chanes, Adam Scott, Christina Openshaw, Annika Howell, Jesse Ives, Michael Buck, and Mark Miller
Mentor: Joel D. Schipper

29. **Turbomachinery Flow Test Rig for Use in Future Labs (Poster & Demonstration)**
Kaylyn Beseler, Zachary Bissonnette, Joshua Eis, Alexander Grant, Jessica Hodge, and Michael Wirges
Mentors: Michael Fabian and Brenda Haven

Paul Adelgren,
Ryan Ashey, and
John Lewandowski
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Michael Fabian
Department of Aerospace & Mechanical Engineering, College of Engineering

Supersonic High Atmospheric Remotely Piloted Unmanned Aircraft System (SHARP UAS)

IGNITE GRANT AWARD

The SHARP UAS project explores a new way to achieve and test aircraft at speeds in excess of Mach one. The aircraft (SHARP UAS) will be taken up and dropped from a weather balloon at an altitude of about 120,000 feet, near space. After reaching its maximum speed during free-fall it will be slowed down using a safety parachute and allowed to glide to the ground. This project also incorporates the use of variable-sweep wings, swing-wings. One of the biggest problems pilots faced when flying hypersonic aircraft, such as the SR-71, was slowing down the aircraft to be refueled. This problem can be solved using swing wings. The SHARP UAS will be designed to efficiently fly at Mach one and at slower glide speeds to reach the ground after free-fall.

Poster Presentation with Model

The Level of Supervision Over Individuals on Probation Affects the Rate of Recidivism

Isaac Anderson,
Peter Bailey,
Melissa Berg,
Julamon Boonprohm,
Sophia Bull,
Jessica Embrey,
Ryan Ferguson,
Cameron McCauley,
Chelsey Mendenhall,
Austin Mosgrove,
Rachel Parrent,
Mary Ripps,
Ashley Ruzicki, and
Rikki Stutsman
College of Security and Intelligence

MENTOR:
Karen Meunier
College of Security and Intelligence

Placing an individual on probation that was found guilty of a criminal violation has dated back as far as 1841. The Boston Police Court released an individual who was arrested for public intoxication to the custody of John Augustus, a Boston cobbler, who later was coined to be the "Father of Probation." The success of this first probation trial led to what is now considered a better alternative to jail for many offenders. As the trend moves toward "evidence-based" practices where law enforcement policies and procedures are based on empirical research results, the question has been raised as to what the best practice to reduce the recidivism rate might be, either more or less supervision for an individual on probation. The National Institute of Justice reported that nationally, recidivism is high: tracking 404,638 prisoners in 30 states after their release from prison in 2005, about two-thirds (67.8 percent) of released prisoners were rearrested. This paper will examine the effects of probation supervision on the recidivism rate for the state of Arizona. Through statistical data collected from five regions in the United States, a comparison will be made to the levels of probation supervision to the rate of repeat offenders. The regions were broken down into: West, Midwest, Northeast, Southeast, and Southwest. The research finding will have a significant impact on the planned revisions of Arizona laws as it relates to the best levels of supervision for individuals on probation.

Poster Presentation

Michelle Bennett
Department of Business,
College of Arts and Sciences

MENTOR:
Jacqueline Luedtke
Department of Applied Aviation Sciences

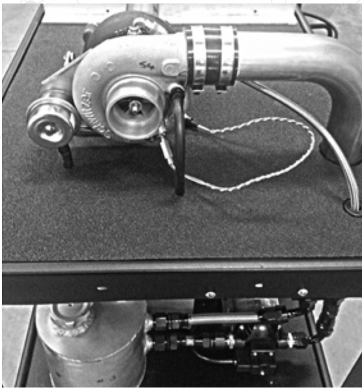
Brent Bowen
Department of Aeronautical Sciences,
College of Aviation

A Concept Model for Comparative Analysis Applied to the U.S. Airline Industry

IGNITE GRANT AWARD

The objective of this research is to analyze the trends in quality and performance of US airlines over the past ten years and determine what economics factors influence the level service. By identifying variables that directly affect the level of performance using data from Airline Quality Rating (AQR), service benchmarks for the airline industry can be established. Industry standard is set by AQR providing consumers and industry watchers objective performance-based data to compare performance quality among different US airlines. The AQR weighted average formula highlights criteria including baggage handling, customer complaints, denied boarding and on-time arrivals. Analyzing the data over the past ten years (2004-2013), this research will utilize the application of a comparable trend analysis methodology resulting in both industry wide and airline specific benchmarks. Financial decisions, policies, technology and flight services are analyzed to determine what business strategies provide the best service to consumers, and in result, the highest ratings in the annual AQR report. Through the analysis of these best practices of top performing airlines, other airline operators can improve quality of service through the use of benchmarking. Data used in this research are readily available from the Department of Transportation and are considered important to the consumers regarding airline quality. Through the collected data and analysis, airlines, government entities and the traveling public will be able to make better decisions, implement policies and develop best practices.

Poster Presentation



Turbomachinery Flow Test Rig for Use in Future Labs

IGNITE GRANT AWARDEE

The rig that is required for ME446L: Thermal-Fluid Science and Energy Measurement Laboratory, available to Mechanical Engineering students in 2016, allows for data acquisition using sensors that are placed on a flow test rig. Students will use this flow test rig to acquire experimental data and use that data to determine properties discussed throughout the curriculum. This rig provides students with the opportunity to use equipment designed for mechanical testing, while learning valuable industry testing and analytical skills.

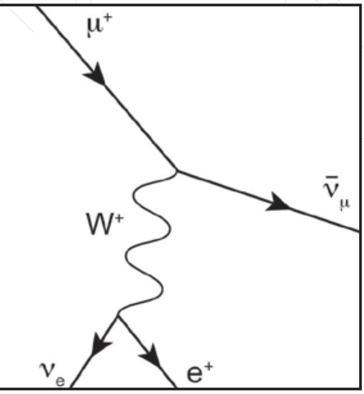
ME446L requires a test rig where sensors are placed throughout to measure air properties like temperature and pressure used to calculate mechanical properties like work and efficiency. The rig is comprised of a turbocharger typically used in automobiles, sensors that will measure pressure, temperature, and RPM, a large air compressor to spin the turbocharger, a data acquisition unit to read-in the sensor measurements into a program called LabVIEW, a bell housing to direct flow into the compressor side of the turbo, an oil pump and fittings to lubricate the bearings of the shaft, and mounted on a cart with a sound-deadening foam box where the air exits the compressor and turbine.

This test rig will be designed, built, and tested by students, for students, and will prove to be an immediate benefit to the university. This flow test rig will be a tangible deliverable by April 2015, with the potential for future research with students and faculty alike.

Poster Presentation and Demonstration

Kaylyn Beseler,
Zachary Bissonnette,
Joshua Eis,
Alexander Grant,
Jessica Hodge, and
Michael Wirges
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Michael Fabian and Brenda Haven
Department of Aerospace & Mechanical Engineering, College of Engineering



Ian Brubaker, John Dallyn, and Jasmine Gill
Department of Physics, College of Arts and Sciences

MENTOR:* *Darrel Smith
Department of Physics, College of Arts and Sciences

Measurement of the Lifetime of Cosmic Ray Muons

In this experiment cosmic rays create scintillation light as they pass through a 5-gallon mineral oil/scintillator detector. Some of the low-energy cosmic muons come to rest in the detector and their subsequent decays ($\mu^+ \rightarrow e^+ \nu_\mu \bar{\nu}_e$) are observed as a second burst of light. The decay lifetime of 10,392 stopping muons were measured and the mean muon lifetime τ_μ was calculated. The composition of cosmic muons includes both positive and negative muons; however, a small fraction of the μ cosmic rays are captured by hydrogen atoms in the mineral oil (CH_2) thus affecting the accepted lifetime of muon decays ($2.197\ \mu S$). The muon lifetime measured in this experiment, $\tau_\mu = (2.092 \pm 0.019)\mu S$, does not differentiate between positive or negative muons and is consistent with the occurrence of μ^- capture on hydrogen.

Oral Presentation

Eagle Aerospace IREC Team

EAGLE PRIZE AWARD

William Carpenter,
Jayneth Bangalore,
Aaron Butler,
Bryce Chanes,
Curt Chen,
Daniel Griffith, and
Katherine Higgins
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Michael Fabian
Department of Aerospace & Mechanical Engineering, College of Engineering

Eagle Aerospace is a team, which represents Embry-Riddle Aeronautical University Prescott Campus in the Intercollegiate Rocketry Engineering Challenge (IREC) competition. The competition is hosted each June in Green River, Utah by the Experimental Sounding Rocket Association. University teams from three continents compete in two tiers of competition: Basic and Advanced. Both tiers require teams to build a rocket to loft a 10-pound payload to as close to a target altitude as possible before safely recovering it under a parachute. The target altitudes are 10,000-feet for the Basic tier and 25,000-feet for the Advanced tier. Eagle Aerospace is competing in both tiers of the 2015 competition, in which they will build a conventional amateur rocket for the Basic tier and an experimental boosted dart design for the Advanced tier.

Poster Presentation

William Carpenter,
Aaron Butler,
Julia Levitt,
Laura Pelletier,
Raeann VanSickle,
and Ben Wilson
Department of Aerospace & Mechanical Engineering, College of Engineering

Richard Reksoatmodjo
Department of Physics, College of Arts and Sciences

MENTOR:
Brenda Haven
Department of Aerospace & Mechanical Engineering, College of Engineering

Eagle Space Flight Team Propulsion Group

IGNITE GRANT AWARD

The Eagle Space Flight Team was created with the goal of becoming the first undergraduate team to design, build, and launch a rocket capable of suborbital spaceflight. To accomplish this task, the team is broken down into multiple sub teams, each focused on a specific aspect of research. The Propulsion group's concentration is on the development, manufacturing, and testing of the solid-propellant rocket motors to be used in the team's flight vehicles. In order to do this, the team must create a new propellant formulation, perform a ballistic characterization of that propellant, and then use it to design motors tailored to the flight profiles for which each flight vehicle is intended. The end goal of the research conducted during the 2014-2015 academic year is a 4-inch-diameter motor capable of launching a flight vehicle to 40,000-50,000-feet.

Poster Presentation

Eagle Space Flight Team

IGNITE GRANT AWARD

The Eagle Space Flight Team was created with the goal of becoming the first undergraduate team to design, build, and launch a rocket capable of suborbital space-flight. In order to achieve this goal, the team will have to design a rocket capable of atmospheric flight at speeds over Mach 5 and launch it on one of the largest amateur rocket motors ever made. Over the next three years, the team will progress towards accomplishing this feat through a series of incremental test flights. Before the space flight, the team will build three subscale rockets designed to reach altitudes of 20,000, 50,000-feet, and 100,000-feet, respectively. These rockets will allow the team to develop, test, and refine the technologies needed for the final flight to over 350,000-feet. We believe that this progressive approach will lead the team to success.

Poster Presentation

Bryce Chanes
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Julio Benavides
Department of Aerospace & Mechanical Engineering, College of Engineering

Matthew Haslam
Department of Humanities and Communication, College of Arts and Sciences

Michelle Clifford and Samarth Marudheri
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Lance Traub
Department of Aerospace & Mechanical Engineering, College of Engineering

Effect of Gurney Flaps on Aft Swept Wings

IGNITE GRANT AWARD

The effect of Gurney flaps on lift augmentation has been tested and documented widely in the aerospace community. However, a literature survey shows no published results on the effect of Gurney flaps on aft swept wings for low Reynolds numbers. Swept wings are commonly used on commercial airliners. If found effective, Gurney flaps would serve as a cheap geometric modification to achieve significant lift augmentation. The objective of this project will be to bridge this gap in the industry through wind tunnel testing multiple configurations of Gurney flaps on three different sweep angles of the wing: 0deg, 45deg and 60 deg. The lengths of the Gurney flaps tested will be zero, two and four percent of the chord of the wing. The testing will be done at a Reynolds number of 100,000 and 150,000 respectively. A wedge wing and a S8036 airfoil wing (both rapid prototyped) will be used for wind tunnel testing. The wedge wing testing and analysis have been completed. From the initial testing of the wedge wing, it was found that the highest lift augmentation was found for the 4 percent Gurney flap case, which was the highest length Gurney flap tested.

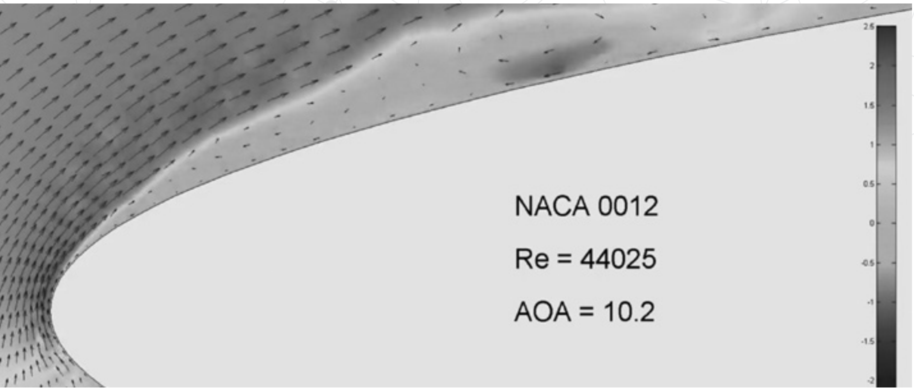
Poster Presentation

Blended Wing Aerodynamic Research

**Michelle Clifford,
Tatiana Torriani,
Seerat Sangha,
Morgan Conklin,
Hannah Morris, and
Noor Rashid**
Department of Aerospace & Mechanical Engineering, College of Engineering; Society of Women Engineers Research Committee, College of Engineering

In this study, a blended wing body (BWB) aircraft model was designed, and has been fabricated and tested with the objective of maximizing aerodynamic efficiency as well as determining if boundary layer ingestion from top surface mounted engines results in less drag. The purpose of this study is to prove that BWB aircraft designs are more efficient than traditional cylindrical fuselage and wing designs. Wind tunnel testing as well as computational fluid dynamic (CFD) analysis has been done to support this hypothesis. Drag reduction from boundary layer ingestion as well as a more aerodynamic body are the two focus points of this project. Showing that both of these factors are improved by using a BWB design (and thus result in less energy required to fly) is the goal of this study.

Poster Presentation



Brian Cowley
Department of Aerospace & Mechanical Engineering, College of Engineering

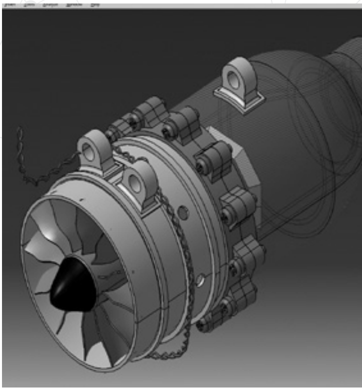
MENTOR:
Wally Morris II
Department of Aerospace & Mechanical Engineering, College of Engineering

The Effects of Finite Difference Schemes on the Accuracy and Stability of CFD models

ARIZONA SPACE GRANT AWARD

A research project is currently being conducted to study the effects of artificially ionized air on aircraft drag. Computational fluid dynamics plays a large part in this research. Without appropriate attention given to accuracy, stability, and computational-cost, the data gained from these computer models could lead researchers astray. There is a code being used for the current wing geometry that has yet to be tested for accuracy in predicting flow fields about the aircraft. This research proposes to determine whether the code's current solver scheme or some alternative is the optimal method to use. These results will be compared with experimental data where available. The goal of this study is to reduce the error in computations from the code, leading to improved results for the research team to base its research decision on.

Oral Presentation



Unmanned Aerial Vehicle (UAV) Propulsion Research: Conceptual studies of Ultra-Compact Shaft-less Jet Engines for Next Generation UAVs

IGNITE GRANT AWARD

Tyler Eiguren,
Trever Douglas, and
Tre Buchanan
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Michael Fabian and
Shigeo Hayashibara
Department of Aerospace & Mechanical Engineering, College of Engineering

Unmanned Aerial Vehicles are becoming more commonly used in today's society, ranging anywhere from military applications to entertainment for enthusiasts and hobbyists. The complexity of current generation UAV's propulsive devices, based upon a scaled turbine engine and separate gas and electrically powered rotating fan blades, require regular maintenance for every 24 hours of flight. This added cost coupled with necessary intricate machinery deters UAV designers from such engines, leaving a void in current production. Our research team believes that by combining a simplified alternative compression and combustion process with an electrically driven fan, we can develop an energy efficient, reliable, and cost effective next generation small-scale jet engine for UAVs. The underlying foundation to our design concept, "Ultra-Compact Shaft-less Jet Engine", was originally formulated by Cal State LA; our team is expanding on their model with innovation through simulation based design optimization, detailed component analysis, and experimental verifications in aerodynamics and combustion. A comprehensive study, utilizing Computational Fluid Dynamics based advanced computer-simulation analysis methodology and experimental investigations (wind tunnel and static tests), is currently underway.

This project will greatly contribute to the current research efforts and potentially open new methods of developing the next generation UAV propulsion systems. Implementing the use of Computational Fluid Dynamics as well as wind tunnel results will yield in validation of the Shaft-less jet engine.

Poster Presentation

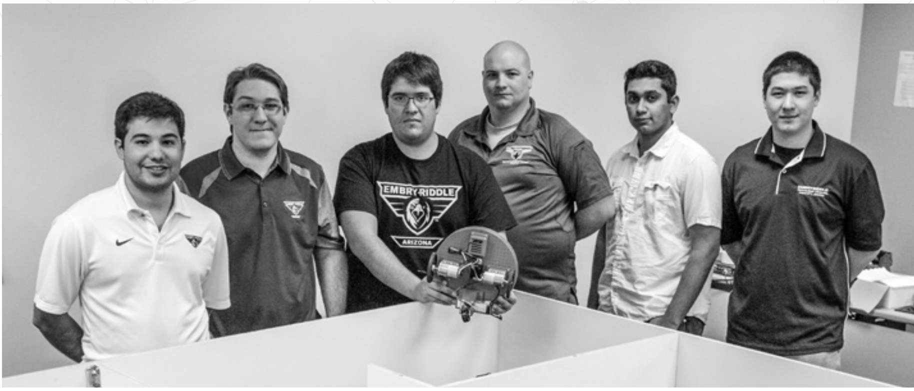
Kelly Feng
College of Security and Intelligence

MENTOR:
Karen Meunier
College of Security and Intelligence

Would Training for Emergency Room Doctors and Nurses Decrease Human Trafficking Rates?

Human trafficking has been around for centuries. However, what most people do not know is that it is more prevalent in today's society than it has ever been in history. It is happening all around us without anyone even realizing. The way human trafficking rings work has changed dramatically within the last decade—causing government officials not being able to solve the problem. One of the biggest problems is that human trafficking victims often do not ask for help—causing the problem to grow bigger and undetected. One potential method to start decreasing human trafficking rates is by training Emergency Room doctors and nurses how to identify human trafficking victims in the Emergency Room. From there, the victims can then start to be helped—and hopefully, brought out of the vicious grasps of their pimps.

Oral Presentation



Eagle Robotics Firefighting Robot

EAGLE PRIZE AWARD

The Eagle 1 is a robot design by the Eagle Robotics Club to compete on the Trinity College Firefighting Robot Contest. In this competition the robot will be introduced into one of four possible mazes. The maze contains four rooms and in one of the rooms a candle will be hidden, representing a fire. Obstacles may be added by the judges along the hallways in the maze. The robot has to autonomously navigate the maze, detect the fire, extinguish the fire and return to its start position. The Eagle 1 has an innovative peace of hardware that has not been used at this competition yet. This is a Lidar which is going to be used to navigate and map the maze faster that with the most common methods. Eagle 1 uses a differential drive with a caster wheel as its drivetrain. A CO_2 canister is used as the extinguishing system, and an array of IR sensors are used to localize the fire.

Poster Presentation and Demonstration

Ricardo Fernandez Garcia, David Gómez Herrera, Narendran Muraleendharan, Geoffrey Winship, Daniel Cohen, Lashin Akimkulov, John S. Cybulski Jr., Gavin Hofer, and Kevin Horn
Department of Aerospace & Mechanical Engineering, College of Engineering

Thomas Fifer
Department of Computer, Electrical, and Software Engineering, College of Engineering

MENTOR:
Douglas R. Isenberg
Department of Aerospace & Mechanical Engineering, College of Engineering

Stephen Bruder
Department of Computer, Electrical, and Software Engineering, College of Engineering

**Thomas Fifer,
Alaysia Marshall,
Brandon Klefman,
Shawn Thompson,
Ryan Claus, and
Tyler Graveline**
*Department of Computer,
Electrical, and Software Engineering,
College of Engineering*

**Garrison Bybee
and Branden Olson**
*Department of Aerospace & Mechanical
Engineering, College of Engineering*

MENTOR:
***Dennis Kodimer
and Matthew Jaffe***
*Department of Computer,
Electrical, and Software Engineering,
College of Engineering*

Eagle Space Flight Team Electronics Group

IGNITE GRANT AWARD

The Eagle Space Flight Team was created with the goal of becoming the first undergraduate team to design, build, and launch a rocket capable of suborbital spaceflight. To accomplish this task, the team is broken down into multiple sub teams, each focused on a specific aspect of research. The Electronics sub team's concentration is on the avionics package included on the rocket which is responsible for deploying the drogue and main parachutes at the appropriate times in addition to transmitting data to locate the rocket such as GPS coordinates. Over the next three years, the Electronics team will continue to improve the avionics package and design a ground station that will display in real time a 3D model of the rocket as it flies. Stretch goals include a live video feed to the ground station.

Poster Presentation

NASA Human Exploration Rover Challenge

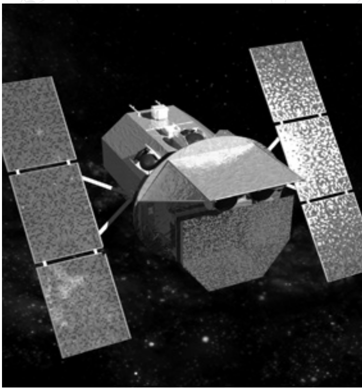
Estelle Fortes,
Johnnie Perry,
Jessica Turcios, and
Jessica Chow
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Brenda Haven
Department of Aerospace & Mechanical Engineering, College of Engineering

EAGLE PRIZE AWARD

In continuation of a two-year project, a team of 14 undergraduate engineering students completed design and fabrication of a simulated lunar vehicle for the 2015 NASA Human Exploration Rover Challenge. The objective of the project was to give students hands-on engineering experience early in their undergraduate education. The project was divided into five subsystems, each completed using a collaborative team effort: structure, steering, drive-train, suspension, and wheels, tires and axel. The structure design consists of a 6 x 2.5-foot rectangular chassis of aluminum tubing that is able to hinge at the middle per the competition requirements and endure up to 600 pounds of instantaneous load. In order to absorb the forces of the competition's terrain, an independent suspension design was chosen to withstand 2.5 g. Additionally, Britek energy return wheels were chosen to meet the non-pneumatic and non-rubber requirements and aid in the suspension of the rover with the use of their spring-like tire design. The drivetrain consists of a free wheel and differential design to enable independent wheel rotation throughout the course. This design will enable our team to successfully compete with other top academic institutions in the world.

Poster Presentation and Demonstration



LIGO-Virgo-SWIFT Collaboration on the Emission of Gravitational Waves from Supernovas

IGNITE GRANT AWARD

The Core-Collapse supernovae (CCSNe) mark the explosive end of the lives of massive stars. The mysterious mechanism behind CCSNe explosions could be explained by detecting the corresponding gravitational wave (GW) emissions by the laser interferometer gravitational wave observatory, LIGO. GWs are extremely hard to detect because they are weak signals in a floor of instrument noise. Optical observations of CCSNe are already used in coincidence with LIGO data. Using the SWIFT satellite, there can be a monitoring of galaxies using the X-ray probe by observing X-ray transients in coincidence with optical CCSNe. And so, even if a supernova had its light absorbed with dust, X-ray transients that are more penetrating, and thus could be used as a hint on where to search for GWs. The main goal of this research will be to quantify the benefits for LIGO by using the SWIFT satellite to monitor galaxies within 20 Mega parsecs from Earth.

The project will consist of two phases: a training phase where global knowledge of the properties of CCSNe would be achieved, as well as a research phase where the survey database and literature will be used to conduct independent evaluation and estimations of how many CCSNe could be detected by SWIFT by looking for X-ray flashes. The result will be used at a LIGO-Virgo-SWIFT conference that will be based in Italy in June to produce a memorandum of understanding between the two collaborations.

Oral and Poster Presentation

Kiranjyot Gill
Department of Physics,
College of Arts and Sciences

MENTOR:
Michele Zanolin
Department of Physics,
College of Arts and Sciences

Christina Halverson, Benjamin Anderson, Aaron Taylor, Kyle Solloway, Meghan Callaway, Kevin Vicencio, Jennifer Transue, Mo Sabliny, Adrienne Rector, Zachary Henney, Matthew Brown, Alexander Noyes, and Stephen Hahn
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Julio Benavides
Department of Aerospace & Mechanical Engineering, College of Engineering

M. Angela Beck
Department of Humanities and Communication, College of Arts and Sciences

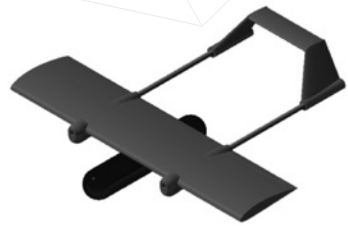
Precision Automated Lander (PAUL)

IGNITE GRANT AWARD

The Precision Automated Lander (PAUL) will be a semi-autonomous lander with the ability to safely deliver a small RC vehicle payload from one point on the earth's surface to another. During its trajectory, PAUL will achieve a minimum vertical height of 3 meters (approximately 10 feet) above the ground and traverse a minimum of 20 meters (approximately 65 feet) across the Embry-Riddle RC Field, where it will land at a predetermined location. Once PAUL has landed, a payload containment bay door will open and the RC vehicle will remotely maneuver off the lander. This mission simulates a real-world extraterrestrial lander mission where a vehicle deploys a scientific rover once it has landed on a planet, as in the mission to Mars. However, what makes this system different from the one used on Mars is that PAUL is Earth-based and will be reusable for multiple system tests.

PAUL was designed and is currently being fabricated by the 13-member team, Perigalacticon Industries. This project is to fulfill requirements for the Spacecraft Preliminary and Detail Design capstone courses for the Astronautical track of Aerospace Engineering.

Poster Presentation and Demonstration



Small Unmanned Aerial System for Aerial Mapping and Infrared Detection

EAGLE PRIZE AWARD

The Team AIR X2V6 UAV, designed and built by Team AIR from Embry-Riddle Aeronautical University in Prescott, AZ is designed to the specifications of the Small Unmanned Aerial System Competition hosted by AUVSI. The main part of the competition is the autonomous portion. This involves autonomous takeoff and landing as well as autonomously mapping a specified area and locating targets within this area. Secondary tasks include, locating an infrared target, dropping a small payload on a bulls-eye, and connecting to a Wi-Fi router. Judging is based 50 percent on accomplishing the mission task, 25 percent on a submitted journal paper, and 25 percent on an oral presentation given at the competition. The planned system characteristics include, 900 MHz for telemetry, 2.4 GHz for safety pilot controls, and 5.8 GHz for imagery transfer. The X2V6 UAV is powered by lithium-polymer batteries for an estimated flight time of 40 minutes. The aircraft has a wingspan of 116-inches and a maximum takeoff weight of 11 pounds. The X2V6 UAV will be operated in simulated competition conditions, and is designed to meet all performance requirements.

Poster Presentation

Nick Harris, James McClure, Daniel Shreiar, Jason Lathbury, Jesse Ives, Kevin Prasad, and Michael Roznick
Department of Aerospace and Mechanical Engineering, College of Engineering

Michael Trovato and Russell Meehan
Department of Aeronautical Sciences, College of Aviation

Andrew Grant and Flaviu Ciobanu
Department of Business, College of Arts and Sciences

Lorenzo Coykendall
Interdisciplinary Studies, College of Arts and Sciences

MENTOR:
Sean Jeralds
Department of Aeronautical Sciences, College of Aviation

Jacob Heilmann,
Kevin Cloonan, and
Nicholas Arnold
Department of Aerospace & Mechanical Engineering, College of Engineering

Brenda Moerchen
Department of Computer, Electrical, and Software Engineering, College of Engineering

MENTOR:
Jeffrey Ashworth
Department of Aerospace & Mechanical Engineering, College of Engineering

Networking of Autonomous Small Unmanned Aerial Systems (SUAS)

IGNITE GRANT AWARD

The development of a network between autonomous Small Unmanned Aerial Systems (SUAS) will advance the robotics industry and increase the usage and effectiveness of robotic systems. Multiple networked aerial robots can divide labor to decrease mission time; relay signals of robots outside the signal range for the ability to broadcast real-time data; provide the ability to change mission parameters and division of labor if new robots enter the mission zone or an assigned robot experiences a critical failure.

Poster Presentation

Lucas Mackey
Department of Business,
College of Arts and Sciences

MENTOR:
Cindy Greenman
Department of Business,
College of Arts and Sciences

A Comeback for the Combi Carrier

IGNITE GRANT AWARD

The Combination aircraft, or the Combi for short, is a multimodal type of aircraft used in airline and military operations. There is typically a cargo hold in the front half of the plane, depending on the variant, and the other half is reserved for a traditional type of passenger cabin. Currently, the variant is stuck between a complete retirement and a major comeback in the airline industry. This tri-semester research project aims to prove that when using the combination aircraft on routes involving fluctuating passenger demand, this variant will produce higher profit margins than the implementation of a freighter or pure passenger airliner. A formal analysis of the benefits and drawbacks of the Combi carrier will allow airlines to better assess their network planning strategies. From this research, airlines can pinpoint on which routes a Combi aircraft will have a better operating margin, and will be better informed on the predicted effects of the use of the Combi carrier.

Poster Presentation

John Marbut
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Lance Traub
Department of Aerospace & Mechanical Engineering, College of Engineering

The Effects of Upper Surface Modifications on Low Reynolds's Flight

IGNITE GRANT AWARD

The research conducted was focused on manipulating the upper surface boundary layer over an airfoil through controlling transition. This control would prove beneficial for low Reynold's flight by reducing the pressure drag on airfoil, which could significantly improve the efficiency of small unmanned aerial vehicles. The models used in testing contained two different types of upper surface modifications. The first set was based around a series of circular extrusions, the circles were varied by size, depth, and spacing. The second set of models were based on a triangular ramp similar to that of a NACA inlet, the ramps were varied by size, depth, and spacing. The results of testing thus far has shown that the model with the deepest circular extrusion experiences a shift in its zero angle of attack while the model with the greatest distance between circles illustrated an early reattachment of the separated flow. Testing of the NACA inlets is still under way, although some preliminary results show that certain models have their lowest drag at a point where positive lift is being generated.

Oral Presentation

Team Eagle Wingsuit: Improving Wingsuit Performance and Design

IGNITE GRANT AWARD

Caity L. Mello,
Jason Lathbury,
Matthew Vis,
Brian Cowley,
Joshua W. Warren, and
Christopher R. Reed
Department of Aerospace & Mechanical Engineering, College of Engineering

Glenn H. Borland and
Ben Salisbury
Department of Aeronautical Sciences, College of Aviation

Joseph John Gomez
Department of Applied Aviation Sciences, College of Aviation

Emily K. Gray
Department of Physics, College of Arts and Sciences

MENTOR:
Timothy Sestak
Department of Aeronautical Sciences, College of Aviation

Wingsuits are one of the newest and most fascinating developments in human aviation. They give the wingsuit pilot the feeling of real flight and extreme maneuverability in the air. A skydiver falls 12,500 feet through the air in 60 seconds. From the same altitude, a wingsuit pilot can extend the time in flight to about three minutes. Despite the sport's popularity, wingsuit performance relative to other forms of aviation is poor, with glide ratios of only three feet forward for every one foot of altitude loss. Team Eagle Wingsuit (TEW) is pioneering research and development on wingsuit aerodynamics. The team is investigating the impact of the fabrics used in contemporary wingsuit designs. Our hypothesis is that the fabrics currently used to make wingsuits act much like frost on a wing, which greatly reduce the lift of an aircraft. TEW also plans on developing models to select more aerodynamic airfoil shapes for new wingsuit designs. The team is also investigating the effect of stabilizing the leading edges of the wingsuit's ram-air inflated wings to prevent lift reduction due to in-flight deformation. Thus far, the team has fabricated its own, robust, two-channel, wind tunnel balance and fabricated two airfoil/wing test articles for wind-tunnel testing. The team is currently collecting data on the model wing with and without fabric covering to determine whether or not the fabric causes a reduction in lift. TEW has completed a preliminary round of flow visualization studies on the test articles with and without fabric, using UV fluorescent micro tufts.

Poster Presentation

ERAU AIAA Design-Build-Fly

EAGLE PRIZE AWARD

The ERAU Prescott chapter of AIAA will present the accomplishments of the student design team leading up to the 2015 AIAA Design Build Fly competition at Raytheon Missile Systems in Tucson. A remote controlled aircraft meeting and exceeding all competition performance requirements was designed and fabricated by the 30-plus students of the team. Additionally, a 60-page report was submitted detailing the project starting from initial considerations and advancing through flight test verification of aircraft capabilities. The success of this project was enabled by the E-Prize and SGA funding received to support our efforts throughout the year. The lessons learned regarding management and planning, engineering design approaches, and experimental validation allowed team members to develop and improve their practical engineering abilities over the course of the Fall 2014 and Spring 2015 semesters.

Poster Presentation

Bryce Milnes and
Chris Crawford
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
David B. Lanning, Jr. and
Jacob W. Zwick
Department of Aerospace & Mechanical Engineering, College of Engineering

The Chronicles: A Living History Project

IGNITE GRANT AWARD

Karina Munoz, Aspen Weichberger, Glenn Borland, Bethany Hawkins, Nathaniel Howard
College of Security and Intelligence

Dakota Burklund and Glenn Borland
Department of Aerospace & Mechanical Engineering, College of Engineering

Darvyn Robinson
Department of Business, College of Arts and Sciences

MENTOR:
Geoffrey Jensen
College of Security and Intelligence

The Chronicles is a living history project that was envisioned by professor and veteran Geoffrey Jensen. The project will focus on veterans, specifically World War II veterans that are in Yavapai County. The project will interview and record participants through audio and visual methods. The types of questions that will be asked will explore the veterans' history and how their service affected them before, during, and after they finished. These interviews will be available to the public through ERAU Prescott Library's Scholarly Commons. The participants, the community and Embry-Riddle as a whole will benefit from the project as participants will have a safe median to share their experiences, the community, including researchers, will have the opportunity to explore the courageous stories that these men and women share, and ERAU will have the pride of knowing that they provided the platform for these veterans to share their stories. For the Presentation for Discovery Day, The Chronicles will show clips from its first interview.

Poster Presentation with Video

Eagle Space Flight Team Aerodynamics Group

IGNITE GRANT AWARD

The Eagle Space Flight Team was created with the goal of becoming the first undergraduate team to design, build, and launch a rocket capable of suborbital spaceflight. To accomplish this task, the team is broken down into multiple sub teams, each focused on a specific aspect of research. Aerodynamics sub team's concentration is on everything regarding the flight profile of the rocket: the body shape, nose cone, and fin design, trajectory analysis, as well as research into non-dimensionalized parameters of successful sounding rockets. So far, Aerodynamics has successfully designed the 3-inch and 4-inch diameter rockets using computer modeling, student-written code, and hand calculations. Over the next three years, Aerodynamics will work towards perfecting a trajectory analysis system, researching further parameters of successful sounding rockets and incorporating this research into designing an efficient space-capable 10-inch diameter rocket.

Poster Presentation

Neil Nunan,
Alexander Lubiarz,
Carl Leake,
Catherine Ayotte,
Jesse Ives,
Jonathan Kozich, and
Nicholas Liapis
Department of Aerospace & Mechanical Engineering, College of Engineering

Donald Crowder
Department of Business, College of Arts and Sciences

MENTOR:
Julio Benavides and William Crisler
Department of Aerospace & Mechanical Engineering, College of Engineering

SAE Eagle Aero: Design Build Fly competition

Sho Okayama, Balmis Lopez, Blaise Golden, TJ Lilyeblade, and Tim Carver
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR: Shigeo Hayashibara
Department of Aerospace & Mechanical Engineering, College of Engineering

EAGLE PRIZE AWARD

SAE Eagle Aero aims to design, build, and fly an original remote-controlled aircraft, and compete in the regular class of the SAE Aero Collegiate Design Series: Aero Design® West" 2015 competition at Van Nuys, CA, April 24-26. By entering, members can benefit from experiencing and becoming familiar with the event, and our representation at the event will allow ERAU Prescott to show leadership in aerospace education".

Members of the team are gaining knowledge in designing, simulation, and hands-on construction of an original aircraft before they partake in their capstone course. The team plans to enter micro and advanced classes in future years. Members analyzed, and built Dumas L-19 Bird Dog kit as a case study. With this experience, the team has come up with the detail design of the original aircraft starting with airfoil selection, and have begun assembling the aircraft, which features dihedral, 10-pound thrust motor, and five channels of control.

Society of Automotive Engineers (SAE) International plays a role of responsibility in developing breakthroughs in transportation methods, including aircrafts, automobiles, and commercial vehicles.

Poster Presentation

Aaron C. Pigott
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Shigeo Hayashibara
Department of Aerospace & Mechanical Engineering, College of Engineering

Analysis of Winglets for Low Reynolds UAV Flight Regimes

ARIZONA SPACE GRANT AWARD

The purpose of this research is to analyze winglets on unmanned aerial vehicles in low Reynolds flight regimes for maximum endurance using computational fluid dynamics. In this study, a baseline UAV design was analyzed in STAR-CCM+ and verified using wind tunnel testing. The CFD model was then fitted with three different winglets and run in the same flight conditions. All cases will be run at a Reynolds number of 300,000 at different angles of attack in order to study improved drag characteristics during a typical flight. Drag polars from each configuration will be generated by STAR-CCM+ and compared to determine the best design for maximum endurance. Post-processing will be performed using FieldView 14 to explain the differences found in the drag polars. The results will demonstrate optimum winglet design for low Reynold's number flight regimes and show the utility of using computational fluid dynamics for such a study.

Oral Presentation

Chad Reinart, Alexander Collins, Brandon Parrish, Claire Schindler, Loren Bahr, Nicole Shriver, Nina Rogerson, and Veronica McGowan
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Julio Benavides and Mark Sensmeier
Department of Aerospace & Mechanical Engineering, College of Engineering

Eagle Space Flight Team Structures Group

IGNITE GRANT AWARD

The Eagle Space Flight Team was created with the goal of becoming the first undergraduate team to design, build, and launch a rocket capable of suborbital spaceflight. To accomplish this task, the team is broken down into multiple sub teams, each focused on a specific aspect of research. The Structures team primarily concentrates on the material and stability of the rocket. focuses on the safety of the rocket with the knowledge of how each part and system is operated and interacts with each other. Knowledge of tolerances of materials, vibrations, deployments and attachments are key to a successful launch. After receiving designs of size and contour from the Aerodynamics team, the Structures team applies this to a 3D computer drawing with accurate dimensions. From this 3D picture, the Structures team is able to apply this to their researched materials and construct the rocket. Structures team has built and conducted thorough analysis on the recently launched Horizons 1. Over the next two years Structures team will research and test the materials as well as perfect the launch vehicle layout they plan to use for the 10" diameter launch to space.

Poster Presentation

Mesoscale Simulation of a Convective Frontal Passage

ARIZONA SPACE GRANT AWARD

This project has utilized the Weather Research and Forecasting mesoscale model (WRF), version 3.6.1 Advanced Research WRF (ARW) to simulate the general features of the boundary layer thermodynamic profiles, winds and convective cloud structure for 2-3 April 2014 1200. Data assimilation and two-way nesting procedures were executed. A fine-grid resolution of 3 km was used for this study, while the coarse grid resolution was set to 30 km. The study investigated cross-wind and cloud microphysical conditions and precipitation characteristics as revealed by National Weather Service (NWS) Dual-Polarization Radar data. A National Science Foundation (NSF) funded Student Training in Airborne Research and Technology (START) two-week deployment of the University of Wyoming King Air (UWKA) research aircraft was conducted at Embry-Riddle Aeronautical University (ERAU) in Prescott, Arizona during early April 2014. Aircraft observations and radiosonde profile data were used with the NWS radar products to evaluate the model simulations.

Poster Presentation

Travis Swaggerty
Department of Applied Aviation Sciences, College of Aviation

MENTOR:
Melanie Wetzel and Dorothea Ivanova
Department of Applied Aviation Sciences, College of Aviation

Human Powered Aircraft Project: Propulsion

IGNITE GRANT AWARD

**Mark Van Bergen,
Kevin Horn,
Michael Chastain,
Ryan Burns, and
Chris Jacobs**
Department of Aerospace & Mechanical Engineering, College of Engineering

MENTOR:
Gary Yale
Department of Aerospace & Mechanical Engineering, College of Engineering

The Human Powered Aircraft Project (HPAP) is focusing on the design of a propulsion system for the next generation of human powered aircraft. Specifically, the team is studying contra-rotating propellers as a design option. Contra-Rotating propellers have many benefits as well as several potential drawbacks; the team will design and test a system for a human powered aircraft to see if the design could allow a human powered aircraft to fly farther, faster, and more efficiently. Human powered flight has a long history of successes and failures. A human powered aircraft is any aircraft fixed wing or otherwise that is powered exclusively by a human, usually in the form of pedaling. Human powered flight has achieved many milestones including a crossing of the English Channel, a flight of 76 miles from island to island in Greece, and a 1-minute sustained hover of a helicopter. HPAP hopes to continue this project past the stage of propulsion design and build an actual aircraft. The goal is to fulfill all requirements for the Kremer Marathon Prize, a prize awarded to the first team to fly 26.2 miles in a figure eight. With the current state of research the team is hypothesizing that the contra-rotating propulsion system would be more efficient and more practicable than the current standard of a single twin bladed propeller.

Poster Presentation

Modeling, Validation, and Energy-Efficient Control of Six-Rotor Aircraft for Multi-Goal Inspection Missions

Kevin Vicencio
Department of Mechanical and Aerospace Engineering, College of Engineering

MENTOR:
Iacopo Gentillini and
Ken Bordignon
Department of Mechanical and Aerospace Engineering, College of Engineering

IGNITE GRANT AWARD
ARIZONA SPACE GRANT AWARD

In multi-rotor, multi-goal, Unmanned Aerial System (UAS) applications, it is often necessary to minimize energy consumption. A preliminary step towards this goal is to create an accurate dynamic model of the system at hand. In this research, a dynamic model of a six-rotor was developed. In addition, experimental wind tunnel data was incorporated into the model to better simulate the six-rotor hardware available. This model was then incorporated into a path planning genetic algorithm to develop near-energy-optimal paths for six-rotor, multi-goal missions. A realistic scenario was also analyzed.

Oral Presentation

Tyson Williams
College of Security and Intelligence

MENTOR:
Thomas Foley,
Karen Meunier, and
Geoffrey Jensen
College of Security and Intelligence

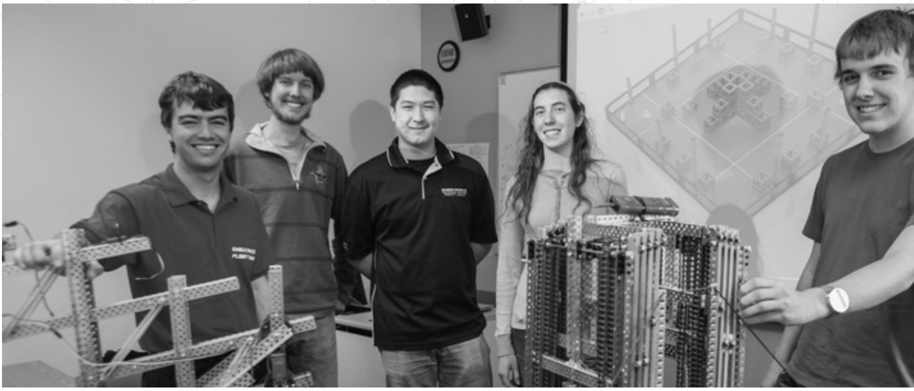
Is White-Collar Crime A Serious Threat and Does Public Perception Affect Penalization?

The purpose of this research is to determine if public perception of white-collar crimes influences the sentencing of the convicted offenders. The earliest definition of this type of crime was "crime committed by a person of…high social status in the course of his occupation." Today, the meaning has expanded to include a variety of nonviolent crimes usually committed in commercial situations for financial gain.[1] Although white-collar crimes have taken place for years, it is relatively recent that it has received public attention. Research commissioned by the Association of Certified Fraud Examiners, found that the cost of white-collar crimes in 2014 totaled in the trillions of dollars.[2] Offenders often evade prosecution because their crimes are less likely to be detected. Various case studies presented show sentencing for white-collar crime is more forgiving than street crime. Not until high-profile cases such as Enron and AIG did offenders receive harsher penalties. However, even those penalties are light considering the impact they had on the economy and personal finances of many. White-collar crime is continuous. When these criminals are caught, the penalties are significantly marginal relative to their impact. A number of factors that may contribute to this disparity: public perception, reporting standards, awareness, victim blaming, and lack of harsher penalties. This combination continues to spearhead the progression of white-collar crime and manifests the façade that it is more socially acceptable to be a white-collar criminal than a street criminal.

Oral and Poster Presentation

[1] https://www.law.cornell.edu/wex/white-collar crime

[2] https://www.acfe.com/rttn-highlights.aspx



2014-2015 Vex Robotics Team

EAGLE PRIZE AWARD

The 2014-2015 Vex Robotics Team is a competition-based group of students on the Embry-Riddle Aeronautical University, Prescott Campus. This year the team competed in the Arizona State Vex U Competition. The game this year that the team competed in was entitled “Skyrise” and was played between two different university level teams, each with two robots. The game is played on a 12-foot by 12-foot square field and pits the two teams against the clock to see who can construct a 6-foot tall tower, made up of 8-inch sections the quickest. Along with that, the teams would need to score 8-inch square cubes on the tower as well as other points around the field. The team used various methods to reach the goal of having two functional robots by the time of the competition. These included discussion, research, testing, and debugging over the course of a 24-week period. From the use of these steps the team was able to assemble and program the two needed robots for the competition. As the culmination of the teams work, the competition took place on February 28, 2015 and overall the team placed third in the ranking of the seven teams at the competition.

Poster Presentation

Geoffrey Winship
Department of Computer, Electrical, & Software Engineering, College of Engineering

Soe Abitia
College of Security and Intelligence

Magnus Bergman, Kristin Sanddager, Josh Warren, Bryce Chanes, Adam Scott, Christina Openshaw, Annika Howell, Jesse Ives, Michael Buck, and Mark Miller
Department of Mechanical and Aerospace Engineering, College of Engineering

MENTOR:
Joel D. Schipper
Department of Computer, Electrical, & Software Engineering, College of Engineering

Matthew Wittal
Department of Physics,
College of Arts and Sciences

MENTOR:
Andri Gretarsson
Department of Physics,
College of Arts and Sciences

The Construction and Application of Radio Astronomy Equipment at the Embry-Riddle Radio Observatory (ERRO)

IGNITE GRANT AWARD

Over the past year, several projects have been put into motion and significant progress has been made to create a usable radio observatory on the Embry-Riddle Prescott Campus. Most notable has been the progress made on the 3.5m radio telescope, which is to be assembled by summer of this year, and completely automated in time for the 2015 Fall semester. Additional contributions to ERRO include the installation of a meteor detector, some work towards the DART (Dipole Array Radio Telescope) project, ongoing diagnostics of the Radio Jove array, the installation and set-up of a magnetometer, and other minor contributions. This Discovery Day presentation will highlight these projects and investigate their applications on the tracking of pulsars, the mapping of galactic hydrogen, possible analysis of the composition of the heliopause, observations of Jupiter and the Sun, and others.

Oral Presentation

Undergraduate Research Institute (URI) promotes research, scholarly, and creative activities at the undergraduate level. By enhancing critical thinking, problem solving and communication skills, URI helps to prepare Embry-Riddle students to contribute as productive individuals, employees, and citizens. URI is university-wide and invites students and faculty from all disciplines to participate.

EMBRY-RIDDLE
Aeronautical University™
PRESCOTT, ARIZONA

prescott.erau.edu/research